Appendix K
Preliminary Technology Assignment Options for Areas with RAL Exceedances

1 Introduction

This appendix summarizes the rationale used to assign the preliminary remedial technology options[1] for each area with RAL exceedances. Figures 19 and 20 in the ROD[2] describe the process by which remedial technologies are to be assigned during the design process, and are included as Attachment K-1. Figure 19 refers to the decision flowchart for intertidal areas, while Figure 20 refers to the decision flowchart for subtidal areas.

Areas that span both intertidal and subtidal areas are presented below as distinct subareas within the RAL exceedance area since different flowcharts apply. Within the intertidal and subtidal subareas, different remedial technologies may apply as a result of other factors, including mixed sample results within the subarea or multiple recovery categories spanning the subarea. Engineering and constructability considerations will be evaluated during 30% and 60% RD to determine the final selected remedial technology in each area.

Potential remedial technologies in intertidal and subtidal areas include the following:

- Intertidal:
  - Monitored Natural Recovery
  - Area-Specific Technology[3]
  - Enhanced Natural Recovery
  - Partial Dredge and Cap
  - Dredge and Backfill
- Subtidal:
  - Monitored Natural Recovery
  - Area-Specific Technology
  - Enhanced Natural Recovery
  - Dredge (with Backfill in Habitat Areas)[4]
  - Cap or Armored Cap

Each area with RAL exceedances is presented below, along with the ROD flowchart questions and answers to select the preliminary remedial technology options.

[1] Multiple technologies could be used within a single area with RAL exceedances.
[2] Figure 20 was corrected after the ROD was published. Reference to Figure 20 herein refers to the corrected version, which was published in a memorandum from EPA dated August 26, 2015.
[3] In areas with structural or access restrictions, area-specific cleanup technologies will be applied as described in ROD Section 13.2.1.3.
[4] Habitat areas were defined in the FS as all areas above -10 ft MLLW.

Area north of upper reach river mile 3.0: The RAL exceedance area immediately north of the upper reach river mile 3.0 on the west bank is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; Monitored Natural Recovery (MNR) is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a Recovery Category (RC) 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No.
- Therefore, **Enhanced Natural Recovery (ENR)** may be applicable for the intertidal subarea within RAL exceedance area north of upper reach.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples located within the subtidal subarea; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within an RC 1 area?
  Partially.
  - RC 1 area:
    - Is there room for cap?
      No, a portion of the RC 1 area is within the Federal Navigation Channel (FNC) or 10 ft buffer area.
    - Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
      To be determined following Phase II PDI data evaluation.
  - Non-RC 1 area:
    - Sediment COC concentrations >ENR upper limits?
      No samples are located within the subtidal subarea; area designation is based on interpolated data. Adjacent COC concentrations are below the ENR upper limit.
    - Room for ENR?
      Yes.

- Therefore, **ENR** may be applicable for a portion of the subtidal subarea and **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for other portions of the subtidal subarea within RAL exceedance area north of upper reach.

Area 1: RAL Exceedance Area 1 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Is there room for cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 1.

Area 2: RAL Exceedance Area 2 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Is there room for cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 2.

Area 3: RAL Exceedance Area 3 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.

- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Is there room for cap?
  No, the RC 1 area is within the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 3.

Area 4: RAL Exceedance Area 4 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Is there room for cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 4.

Area 5: RAL Exceedance Area 5 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Bridge [ST-02] and cable crossing [see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  Yes.

- Is there room for cap?
  Partially. The RC 1 area is within the FNC or 10 ft buffer area, so a cap cannot be placed in most of the area. A portion of the southernmost extent of the area is currently deep enough for cap placement.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the majority of RAL Exceedance Area 5, while **cap or armored cap** may be applicable for the southern extent of the area. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 6: RAL Exceedance Area 6 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No samples are located within the subtidal subarea; area designation is based on interpolated data. Adjacent COC concentrations are below the ENR upper limit.
- Therefore, **ENR** may be applicable for the intertidal subarea within RAL Exceedance Area 6.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No.

- Is there room for ENR?
  Yes.
- Therefore, **ENR** may be applicable for the subtidal subarea within RAL Exceedance Area 6.

Area 7: RAL Exceedance Area 7 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Bridge [ST-02] and cable crossing [see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  There are multiple samples within the intertidal subarea. One sample exceeds the ENR upper limit; three samples do not exceed the ENR upper limit.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **ENR** may be applicable for a portion of the intertidal subarea, and **dredge and backfill or partial dredge and cap** may be applicable for other portions of the intertidal subarea within RAL Exceedance Area 7. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Bridge [ST-02] and cable crossing [see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No samples are located within the subtidal subarea; area designation is based on interpolated data where mixed results are present in the adjacent intertidal subarea.

Adjacent COC concentrations are above and below the ENR upper limit (to be confirmed during Phase II PDI).

- Room for a cap or ENR?
  Yes.
- Therefore, **cap or armored cap or ENR** may be applicable for portions of the subtidal subarea within RAL Exceedance Area 7. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 8: RAL Exceedance Area 8 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Bridge [ST-02] and cable crossing [see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  Yes.
- Is there room for cap?
  No, the area is within the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 8. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 9: RAL Exceedance Area 9 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Bridge [ST-02] and cable crossing [see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  N/A; ENR is not an allowable remedial technology for shoal areas (per ROD Table 28).

- Room for cap?
  No, the area is within the FNC or 10 ft buffer area and within a shoal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 9. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 10: RAL Exceedance Area 10 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Marina floats [ST-20; see Appendix F]), so there may be a need to apply area-specific technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  ENR is not an allowable remedial technology for shoal areas (per ROD Table 28). There are no samples located in the area outside the shoal area, and the area designation is based on interpolated data. Adjacent COC concentrations are below the ENR upper limit.
- Room for Cap or ENR?
  No, the area is within the FNC or 10 ft buffer area and within a shoal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 10. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 11: RAL Exceedance Area 11 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Marina floats [ST-20; see Appendix F]), so there may be a need to apply area-specific technology; this will be determined during 30% design.

- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  N/A; ENR is not an allowable remedial technology for shoal areas (per ROD Table 28).
- Room for Cap?
  No, the area is within the FNC or 10 ft buffer area and within a shoal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 11. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 12: RAL Exceedance Area 12 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Marina floats [ST-20, see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No.
- Therefore, **ENR** may be applicable for the intertidal subarea within RAL Exceedance Area 12. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Marina floats [ST-20; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.

- Sediment COC concentrations >ENR upper limits?
  Yes.
- Is there room for cap?
  No, due to berthing depth needs for the marina.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the subtidal subarea within RAL Exceedance Area 12. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 13: RAL Exceedance Area 13 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (South Park Marina floats [ST-20; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  N/A; ENR is not an allowable remedial technology for shoal areas (per ROD Table 28).
- Room for Cap?
  No, area is located within the FNC or 10 ft buffer zone and within a shoal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 13. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 14: RAL Exceedance Area 14 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples exceeding COC concentrations are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.

- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  N/A; ENR is not an allowable remedial technology for shoal areas (per ROD Table 28).
- Room for Cap?
  No, area is located within the FNC or 10 ft buffer zone and within a shoal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 14.

Area 15: RAL Exceedance Area 15 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for Cap?
  No, area is located within the FNC or 10 ft buffer zone.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 15.

Area 16: RAL Exceedance Area 16 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for Cap?
  No, area is located within the FNC or 10 ft buffer zone and a portion is located within the shoal area.

- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 16.

Area 17: RAL Exceedance Area 17 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for Cap?
  No, area is located within the FNC or 10 ft buffer zone and a portion is located within the shoal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 17.

Area 18: RAL Exceedance Area 18 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (bulkheaded [ST-03; see Appendix F]; there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  Numerous sample concentrations above and below the ENR upper limits.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.

- Therefore, **ENR** may be applicable for a portion of the intertidal subarea, and **dredge and backfill or partial dredge and cap** may be applicable for other portions of the intertidal subarea within RAL Exceedance Area 18. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for a cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the subtidal subarea within RAL Exceedance Area 18.

Area 19: RAL Exceedance Area 19 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for Cap?
  No. area is located within the FNC or 10 ft buffer zone and within a shoal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **partial dredge and cap or dredge (with backfill in habitat areas)** may be applicable for RAL Exceedance Area 19.

Area 20: RAL Exceedance Area 20 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  Yes.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge and backfill or partial dredge and cap** may be applicable for the intertidal subarea within RAL Exceedance Area 20.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the subtidal subarea; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Partially.
  - RC 1 area:
    - Is there room for cap?
      No, area is located within the FNC or 10 ft buffer zone and within a shoal area.
  - Non-RC 1 area:
    - Sediment COC concentrations >ENR upper limits?
      No samples are located within the subtidal subarea; area designation is based on interpolated data. Adjacent COC concentrations are above the ENR upper limit.
    - Room for cap?
      No, cap would impact the FNC or 10 ft buffer zone.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.

- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the subtidal subarea within RAL Exceedance Area 20.

Area 21: RAL Exceedance Area 21 is located in an intertidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No.
- Therefore, **ENR** may be applicable for the intertidal subarea within RAL Exceedance Area 21.

Area 22: RAL Exceedance Area 22 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for Cap?
  No, area is located within a shoal area and the FNC or 10 ft buffer zone.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 22.

Area 23: RAL Exceedance Area 23 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.

- Are there structural or access limitations?
  Potentially yes (bulkhead [ST-03; see Appendix F] and this area is located between the AC Pilot plots); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  Six of twelve samples exceed the ENR upper limit.
  - Locations <ENR upper limit
    - Room for ENR?
      Yes.
  - Locations >ENR upper limit
    - Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
      To be determined following Phase II PDI data evaluation.
- Therefore, **ENR** may be applicable for a portion of the intertidal subarea, and **dredge and backfill or partial dredge and cap** may be applicable for other portions of the intertidal subarea within RAL Exceedance Area 23. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Is there room for a cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the subtidal subarea within RAL Exceedance Area 23.

Area 24: RAL Exceedance Area 24 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for Cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 24.

Area 25: RAL Exceedance Area 25 is located in a intertidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No.
- Therefore, **ENR** may be applicable for the intertidal subarea within RAL Exceedance Area 25.

Area 26: RAL Exceedance Area 26 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples exceeding COC concentrations are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.

- Room for Cap?
  No, area is located within the FNC or 10 ft buffer zone.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 26.

Area 27: RAL Exceedance Area 27 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (bulkheaded [ST-03; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  There are samples with concentrations above and below the ENR upper limits within this area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **ENR** may be applicable for a portion of the intertidal subarea, and **dredge and backfill or partial dredge and cap** may be applicable for other portions of the intertidal subarea within RAL Exceedance Area 27. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the subtidal subarea; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.

- Is there room for a cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the subtidal subarea within RAL Exceedance Area 27.

Area 28: RAL Exceedance Area 28 is located in an intertidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (pier, dolphins [ST-16; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  Yes.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge and backfill or partial dredge and cap** may be applicable for RAL Exceedance Area 28. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 29: RAL Exceedance Area 29 is located in a subtidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Room for Cap?
  No, cap would impact the FNC or 10 ft buffer area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.

- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for RAL Exceedance Area 29.

Area 30: RAL Exceedance Area 30 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No.
- Therefore, **ENR** may be applicable for the intertidal subarea within RAL Exceedance Area 30.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples exceeding COC concentrations are located within the subtidal subarea; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No samples are located within the subtidal subarea, but adjacent intertidal samples do not exceed the ENR upper limit.
- Therefore, **ENR** may be applicable for the subtidal subarea within RAL Exceedance Area 30.

Area 31: RAL Exceedance Area 31 is located in an intertidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (dolphins [ST-04; see Appendix F]); there may be a need to apply area-specific remedial technology; to be determined during 30% design.

- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  There are samples with concentrations above and below the ENR upper limits in the intertidal area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **ENR** may be applicable to a portion of the intertidal subarea, and **dredge and backfill or partial dredge and cap** may be applicable for other portions of the intertidal subarea within RAL Exceedance Area 31. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 32: RAL Exceedance Area 32 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the intertidal subarea; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (Slip 6 pier structure [ST-05; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  Yes.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge and backfill or partial dredge and cap** may be applicable for the intertidal subarea within RAL Exceedance Area 32. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (Slip 6 pier structure [ST-05; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.

- Is the area within a RC 1 area?
  Yes.
- Is there room for a cap?
  No, current depth is above authorized berthing depth.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the subtidal subarea within RAL Exceedance Area 32. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 33: RAL Exceedance Area 33 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (pier and debris deflector [ST-12; see Appendix F]), so there may be a need to apply area-specific technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  Yes.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge and backfill or partial dredge and cap** may be applicable for the intertidal subarea within RAL Exceedance Area 33. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the RAL exceedance area; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.

- Is there room for a cap?
  No, cap would impact the FNC or 10 ft buffer area and berthing area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for the subtidal subarea within RAL Exceedance Area 33. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Area 34: RAL Exceedance Area 34 is in both intertidal and subtidal areas.

Intertidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (wharf [ST-07; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  Yes.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **dredge and backfill or partial dredge and cap** may be applicable for the intertidal subarea within RAL Exceedance Area 34. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  No samples are located within the subtidal subarea; area designation is based on interpolated data. Based on interpolated data, MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Yes.
- Is there room for a cap?
  Yes, except for area near FNC and 10 ft buffer.

- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **cap or armored cap** may be applicable for a portion of the subtidal subarea, and **dredge (with backfill in habitat areas) or partial dredge and cap** may be applicable for other portions the subtidal subarea within RAL Exceedance Area 34.

Area 35: RAL Exceedance Area 35 is located in an intertidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  No.
- Therefore, **ENR** is applicable for RAL Exceedance Area 35.

Area 36: RAL Exceedance Area 36 is located in an intertidal area.

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  Partially.
  - RC 1 area:
    - Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
      To be determined following Phase II PDI data evaluation.
  - Non-RC 1 area:
    - Sediment COC concentrations >ENR upper limits?
      There are samples with concentrations above and below the ENR upper limits in this area.
- Therefore, **ENR** may be applicable for a portion of the intertidal subarea, and **dredge and backfill or partial dredge and cap** may be applicable for other portions of the intertidal subarea within RAL Exceedance Area 36.

Area 37: RAL Exceedance Area 37 is in both intertidal and subtidal areas.

Intertidal subarea:

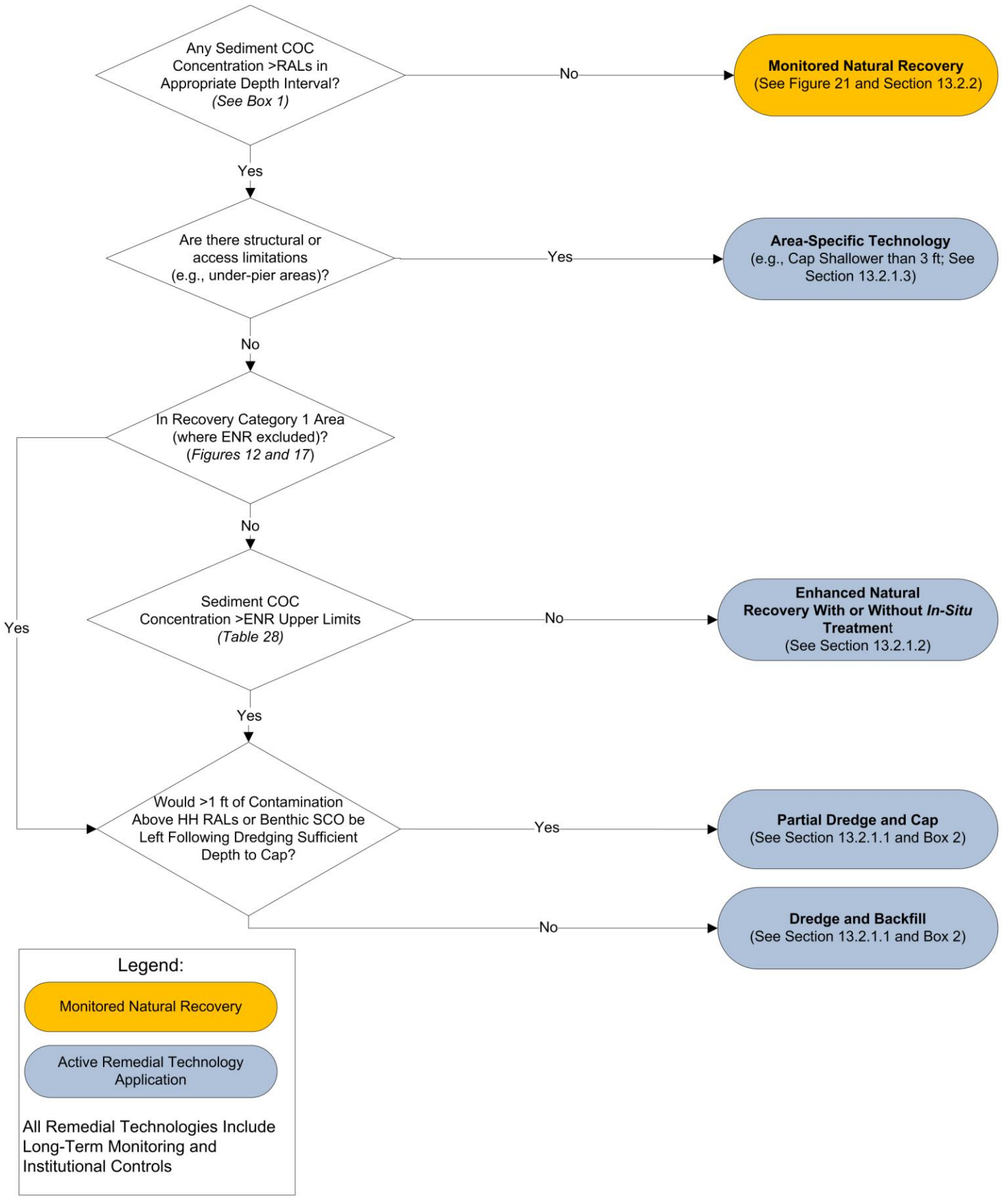
- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  Potentially yes (timber groins [ST-07; see Appendix F]); there may be a need to apply area-specific remedial technology; this will be determined during 30% design.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  There are samples with concentrations above and below the ENR upper limits within this area.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.
- Therefore, **ENR, dredge and backfill, or partial dredge and cap** may be applicable for the intertidal subarea within RAL Exceedance Area 37. Since there is a structure within or adjacent to this area, an area-specific technology may be applicable.

Subtidal subarea:

- Any sediment COC concentration >RALs in appropriate depth interval?
  Yes; MNR is not applicable.
- Are there structural or access limitations?
  No.
- Is the area within a RC 1 area?
  No.
- Sediment COC concentrations >ENR upper limits?
  There are samples with concentrations above and below the ENR upper limits in this area.
  - Locations <ENR upper limit:
    - Room for ENR?
      Yes.
  - Locations >ENR upper limit:
    - Room for ENR?
      No.
- Would >1 ft of sediment with COCs >HH RALs or benthic SCOs remain following partial dredging to accommodate a cap?
  To be determined following Phase II PDI data evaluation.

- Therefore, **ENR** may be applicable for a portion of the subtidal subarea, and **dredge (with backfill in habitat areas) and partial dredge and cap** may be applicable for other portions of the subtidal subarea within RAL Exceedance Area 37.

Attachment K-1
ROD Figures 19 and 20



Box 1. Intertidal Sediments (+11.3 ft MLLW to -4 ft MLLW)

Remedial Action Levels (RALs) and Depth Interval to Which They Apply

Contaminant	Units	Recovery Category 1 Areas		Recovery Category 2 and 3 Areas		Risk Reduction Associated with RALs
		4 in (10 cm) depth interval	1.5 ft (45 cm) depth interval	4 in (10 cm) depth interval	1.5 ft (45 cm) depth interval	
PCBs (Total)	mg/kg-OC	12	12	12	65	Human Health [a,b,c,e]
cPAH	µg TEQ/kg-dw	1000	900	1000	900	
Dioxins/Furans	ng TEQ/kg-dw	25	28	25	28	
Arsenic (Total)	mg/kg-dw	57	28	57	28	
39 SMS COCs	Varies by COC	SCO (see Table 27)	--	2xSCO (see Table 27)	--	Ecological [d,e]

Notes:

1. The average concentrations in depth Interval (e.g., vertically composited samples) are compared to RALs.
2. Human Health RALs and RAO 3 RALs must be met immediately following construction.

[a] RAO 1 - Human health seafood consumption

[b] RAO 2 - Human health direct contact includes beach play, clamming, and netfishing

[c] RAO 4 - Ecological protection for river otter (addressed by meeting human health PCB RAL)

[d] RAO 3 - Ecological protection of benthic community

[e] There are 41 SMS COCs, but PCB and arsenic are principally RAO 1 COCs. SMS also lists toxicity test-out criteria using bioassays. Test-out is not allowed for PCBs or arsenic.

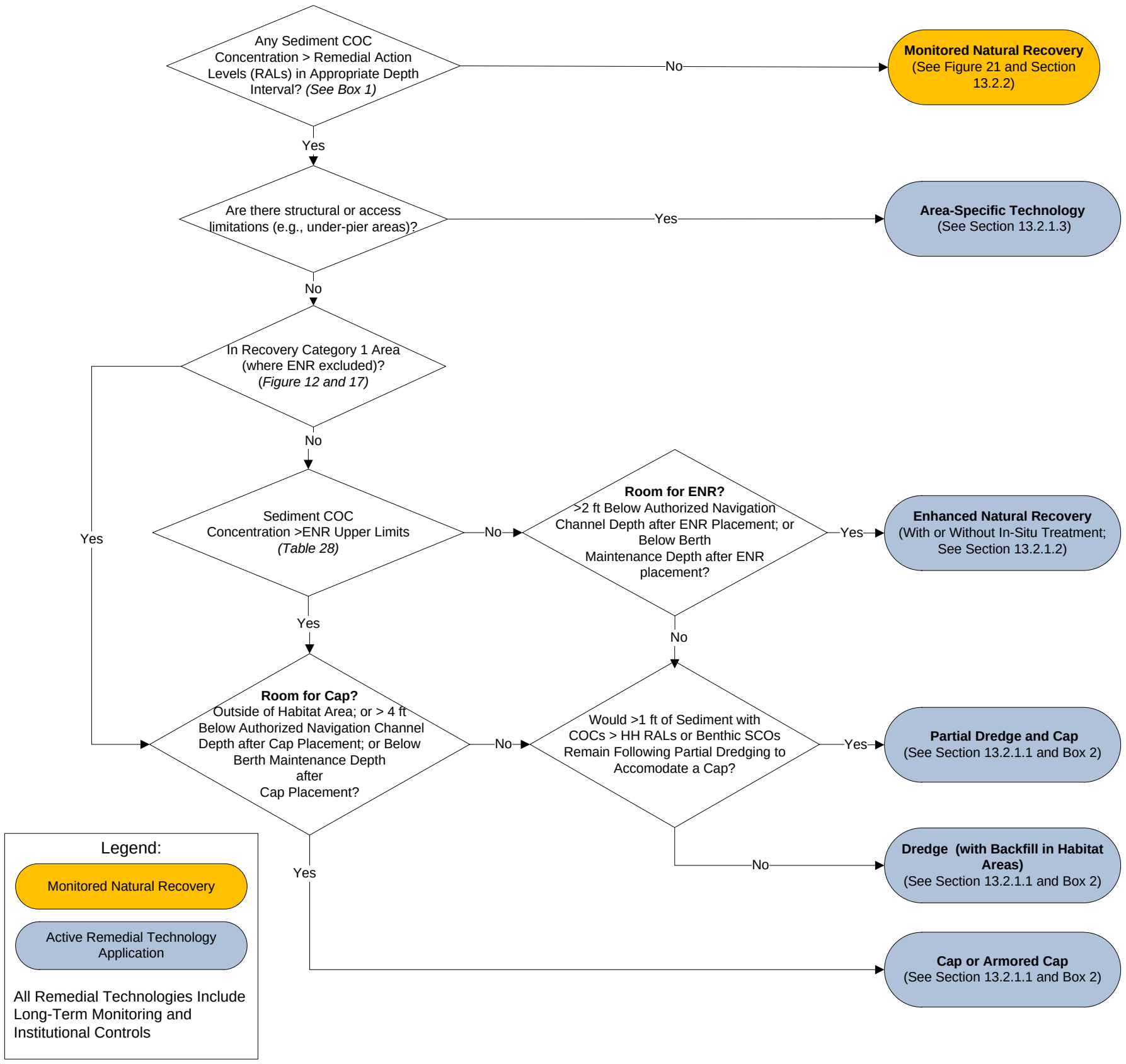
Box 2. Habitat Areas

Elevations of intertidal habitat areas are assumed to be unaffected by addition of 6-9" of suitable materials (i.e., ENR)

Cap,dredge and backfill,or partial dredge and cap to pre-construction grade; finish with suitable habitat layer

In clam habitat areas (Figure 6), caps will generally include 4 ft of suitable clean material Including a minimum 45 cm clam habitat layer

Figure 19. Intertidal Areas – Remedial Technology Applications



Box 1. Subtidal Sediments (-4 ft MLLW and Deeper)

Remedial Action Levels (RALs) and Depth Interval for Application of RAL

Contaminant	Units	Recovery Category 1 Areas: 4 in (10 cm) depth interval	Recovery Category 1 Areas: 2 ft (60 cm) depth interval	Recovery Category 2 and 3 Areas: 4 in (10 cm) depth interval	Recovery Category 2 and 3 Areas: 2 ft (60 cm) depth interval-applied only at potential tug scour areas; See *Footnote 2* and Figure 16	Shoaled Areas of the Federal Channel: See *Footnote 3*. To a depth of 2 ft below the authorized depth for waterway reach[f]	Risk Reduction Associated with RALs
PCBs (Total)	mg/kg-OC	12	12	12	195	12	Human Health [a,b,c]
cPAH	µg TEQ/kg-dw	1000	1000	1000	--	1000	
Dioxins/Furans	ng TEQ/kg-dw	25	25	25	--	25	
Arsenic (Total)	mg/kg-dw	57	57	57	--	57	
39 SMS COCs	Varies by COC	SCO (see Table 27)	SCO	2xSCO (see Table 27)	--	SCO (see Table 27)	Ecological [d,e]

Notes

1. The average concentrations in depth interval (e.g., vertically composited samples) are compared to RALs.
2. Potential Tug Scour Areas are Subtidal Elevations Potentially Susceptible to Propellor Wash (North of the 1st Avenue South bridge located at approximately RM 2 in Water Depths from -4 to -24 ft MLLW, and South of the 1st Avenue S Bridge, in Water Depths from -4 to -18 ft MLLW).
3. Shoaled areas are those areas in federal navigation channel with sediment accumulation above the authorized depth including a 2 ft over-dredge depth; see Table 28. For areas in the navigation channel that are not shoaled, Recovery Categories 1 or 2 & 3 RALs apply. Authorized depths are: (1) from RM 0 to 2, 30 ft below MLLW (from Harbor Island to the First Avenue South Bridge); (2) from RM 2 to RM 2.8, 20 ft below MLLW (from the First Avenue South Bridge to Slip 4); and (3) from 15 ft below MLLW from RM 2.8 to 4.7 (Slip 4 to the Upper Turning Basin).
4. Human Health RALs (and RAO 3 PRGs (Benthic SCOs) in Category 1 areas) must be met immediately following construction.

[a] RAO 1 - Human health seafood consumption

[b] RAO 2 - Human health direct contact includes beach play, clamming, and netfishing

[c] RAO 4 - Ecological protection for river otter (addressed by meeting human health PCB RAL)

[d] RAO 3 - Ecological protection of benthic community

[e] There are 41 SMS COCs, but PCB and arsenic are principally RAO 1 COCs. SMS Also lists toxicity test-out criteria using bioassays. Test-out is not allowed for PCBs or arsenic.

[f] Depth intervals to determine compliance will be determined during Remedial Design.

[g] Caps were assumed to be 3 ft for cost estimating purposes; cap thicknesses will be evaluated by EPA during Remedial Design in accordance with EPA and USACE (1998)

Box 2. Habitat Areas (see Section 13.2.1.1)

Elevations of intertidal habitat areas are assumed to be unaffected by addition of 6-9" materials (i.e., ENR)

Cap, dredge and backfill, or partial dredge and cap to pre-construction grade; finish with suitable habitat layer.

Revised Figure 20. Subtidal Areas – Remedial Technology Application